ployers and employed. Labor has been degraded and despised. There is still a feeling that there must be fixed classes in society, and that the majority must work hard enough to relieve the minority from labor. Once it was the privilege of the employer to command, and the duty of the laborer to acquiesce; but this feeling of inferiority on the part of the employed is gone, and the age of civility is past. The workman has made practical the doctrine of human equality, and looks on those around him as his equals. He no longer respects any distinctions founded on birth and circumstances and not on personal worth and power. He holds truly that labor is service for an equivalent, and that the employer and employed stand as equals in an interchange of service. He does not admit that wages are paid by the employer, but regards them as the product of the joint effort of the employer and employed, of which the laborer should receive his just proportion. In fact, the employer has no more right to dictate to the laborer how he shall seek his interests, and what associations he shall form, and what trades-unions he shall establish, than the laborer has to dictate to the employer in corresponding matters. A great part of the alienation between classes, and the bitterness of the poor toward capitalists, lies in the fact that wages have been substituted for all other ties, and the laborers are regarded but as a part of 'the plant' in a great manufacturing establishment. In American society there is a marked manifestation of the degradation of labor. All labor which involves personal attention, and especially labor in household service, is still thought degrading. The term 'servant' is still used, but it should be banished from a civilized people, and become as obsolete as 'slave' and 'serf.'

There are serious errors that in some form have been advocated by leading political economists, which, under the teachings of such modern popular writers as Henry George, have caused serious evil. They are such maxims as this: that "all wealth is created by labor, and the title to all wealth ought to be vested in the laborers who have produced it." These maxims are fallacious; but they are received with great favor by the multitude, who are led to believe that the accumulation of great fortunes is a wrong to the laborers, and that such fortunes should be divided for the public good.

For the discontent of the laborers, and their disagreement with the capitalists, various remedies have been proposed, but they have proved, in practice, vain and ineffective. This may be said of strikes, lock-outs, and the doctrine of unrestricted competition. A reasonable mode for the settlement of difficulties would seem to be a conference between the classes or their representatives. When a settlement cannot thus be reached, it would seem the wisest course to refer the points in dispute to arbitrators chosen in the usual way. Boards of arbitration may be either temporary or permanent. There are many reasons in favor of permanent boards, which might be as effective in preventing difficulties as in their settlement.

We are persuaded that the present difficulties that threaten the peace and order of society will never be removed till a higher standard of ethics shall prevail. They are the direct result of selfishness, encouraged by the prevalent selfish theory of morals. These are personal sins and social wrongs that civil government may not by law or force correct. It is not according to the will of God, as made known by natural or revealed religion, that a few should control vast fortunes, using them to gratify selfish personal desires, while multitudes suffer not only for want of knowledge, but of bread, and struggle through a brief existence, realizing in no proper sense the true object of life. Nothing is right that is not in accordance with the divine will; hence no man can have the right, though he has the power, to do wrong. Because a gifted man has power to accumulate property, he has no right to arrogantly say, "This is mine and I will spend it as I please." The wealth of the world is designed for the public welfare; and it is the duty of those who have it in charge to consider themselves as only agents, bound to use it so as to serve the greatest good. He who has wealth and does not intend to act thus, is false to his trust, and is the enemy of society.

In the Christian use of money will be found the great remedy for social wrongs. The right use of money will require much tact, wisdom, and skill. Multitudes on multitudes of the poor have low, selfish, sensual aims; and indiscriminate giving to them would only encourage indolence and vice. They need education and culture, and higher ideas of life. All these the right use of money now worse than wasted would secure.

AN INVENTORY OF OUR GLACIAL DRIFT.

AFTER an introduction, and a reference to recent acquisitions in the field of geography and other departments of geology, the southern limits of the great glacial formations of North America were sketched and illustrated by wall map. In addition to the already known limits in the east, new facts were given respecting the outline in Dakota and Montana, the line being found to pass

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nearly due west from the latitude of Bismarck to within forty miles of the Rocky Mountains, where it curves rapidly to the north, and skirts the mountains as far into British America as yet traced. Within the United States the limit of north-eastern drift barely touches that of demonstrative local glaciation from the Rocky Mountains. Westward of this, in the valleys of Flathead, Pend D'Oreille, and Osoyoos lakes, and Puget Sound, are deposits of drift regarded as prolongations of the more general drift of British Columbia, which, if not a continuous mantle, at least passes beyond the character of simple local mountain drift. South of this general drift are deposits of ancient glaciers in the Cascades, Sierras, Rockies, some of the intermediate ranges, and, according to some authorities, the Appalachians. The lacustrine deposits of the great basin region were correlated with the glacial deposits in time and causation.

A wealth of significance lies in the sinuosities, vertical undulations, and varying characters of the southern border. It undulates over the face of the land essentially as much as an arbitrary line from New York harbor to Puget Sound, and could be reduced to horizontality — as it must have been to have marked the margin of some ancient ice-bearing body of water — only by incredible warpings and dislocations. The border of the drift presents three notable phases; one part terminating in a thickened belt, a terminal moraine; another in a thin margin; and a third in an attenuated border of scattered pebbles. The morainic border prevails in the Atlantic region, and lies on or near the limit as far west as central Ohio, beyond which it retires from it. Throughout the rest of the stretch to the Rocky Mountains the attenuated edges prevail. The latter are thought to represent, one a glacial and the other a glacio-natant action. The attenuated borders are believed to delimit an earlier ice incursion, and the morainic border a later one, which overrode the former in the coast region but fell behind it in the interior, having its extension in similar moraines in the interior.

Corroborative testimony is found in facts drawn from orographic attitudes, drainage, erosion, decomposition, ferrugination, vegetal accumulations, and lacustrine oscillations in the great basin. The interval between the two epochs is measured geologically by the cutting down of the beds of the Allegheny, Monongahela, and upper Ohio rivers some two hundred to three hundred feet, chiefly in rock; of the upper Missouri River to greater depth; and by an elevation of the upper Mississippi of eight hundred to one thousand feet. Of the earlier drifts, two important subdivisions seem indicated by present data, and several subordinate ones of the later. The distribution of these was outlined. A third series of drift sheets, of greater uniformity of material and regularity of deposition, occupying the great basins of the St. Lawrence valley, the Red River of the North, and limited areas of the coast region, and delimited in part by beach ridges, was sketched. The major opinion concerning the oldest series favors their glacier origin, but this opinion is not unanimous. Concerning the second, or moraine-bordered group, opinion is overwhelming that they are direct glacier products. Concerning the third series, the weight of opinion favors their subaqueous deposition, either in fringing lakes or in more general submergence. The differentiations of the characters of the three groups were further sketched. Of unstratified bowldery clays or tills, there is the richest variety, ranging through varying combinations of material, texture, and aggregation. Three genetic classes were recognized: 1°, subglacial tills; 2°, englacial or superglacial tills; 3°, subaqueous tills; and 4°, tills ridged by the thrust of the margin of the ice.

Of moraines, terminal, lateral, medial, and interlobate varieties are found. The great terminal moraines overshadow all others in interest and importance. The distribution of the chief ones were shown upon the map. The Nantucket and Cape Cod moraines were regarded, with more confidence than ever, as the equivalents of the Kettle Range of Wisconsin, and the Altamont and Gary moraines of Dakota. Outside of these chief moraines, there are occasional belts of older drift aggregated in the similitude of peripheral moraines. Examples are found in central Indiana, western Montana, and the plains of the British Possessions. Back from the two principal terminal moraines lie several similar partially determined belts, usually of less prominence and continuity.

Our most unique moraines are the interlobate, developed between the tongues into which the great ice sheet of the second epoch was divided at its margin. About a dozen of these, located in half as many states, were recognized; but only a part present full evidence of true interlobate character. Beautiful lateral moraines abound in the mountainous regions of the west, and some were developed by local glaciation supervening upon the ice retreat of the east. Our medial moraines are unimportant, and confined essentially to mountainous glaciation. Allied to the true moraines are special forms of aggregation of the subglacial debris, among which were enumerated: 1°, till tumuli; 2°, mammillary and lenticular hills; 3°, elongated parallel ridges, trending with the ice movement; 4°, drift billows; 5°, crag and

tail; 6°, pre-crag and combings; and 7°, veneered hills. The most remarkable are the mammillary, lenticular, and elongated ridges, frequently grouped under the term 'drumlins.' The lenticular varieties prevail in southern New Hampshire, central and eastern Massachusetts, north-eastern Connecticut, and Nova Scotia; the elongated variety, accompanied by shorter, in central New York; and all varieties in eastern Wisconsin, extending into the northern peninsula of Michigan. About three thousand have been mapped. The total known number probably aggregates ten thousand. No theory of their formation has yet received wide acceptance, beyond a general agreement that they are subglacial accumulations.

Turning to the assorted drift, two classes commonly embraced there were excluded. First, the 'orange sands' of the Mississippi valley, commonly accepted as Champlain deposits. They do not appear to possess the distinctive characteristics of glacial gravels, but are residuary in aspect. If they belong to the glacial period at all, it must be to its earliest stage. Their reference to the Champlain epoch is clearly an error. The second class, set aside as not being strictly glacial, were those reworked by wholly non-glacial agencies; or, in other words, the secondary drifts. Eliminating these, there remain the products of glacial waters working co-ordinately with the ice, of which two classes were recognized: 1°, those that gathered immediately within and beneath the ice body itself, or against its margin; and 2°, those which were borne to distances beyond its limit by the glacial drainage or by peripheral waters. In the first, the presence and restraint of the ice was an essential factor; in the second, it was only a source of material. Of the first class, there are: 1°, the products of streams flowing on the surface of the ice; 2°, of streams plunging from the surface to the base through crevasses; 3°, of subglacial streams in tunnels beneath the ice; 4°, of streams in ice cañons at the border; and 5°, debouchure deposits of streams at the margin. The products embrace a great variety of sub-types of gravel heapings, including isolated mounds, conical peaks, clustered hummocks with inclosed pits and basins, and sharp, steep-sided ridges, often of phenomenal length—all possessing great irregularities of material and stratification, embracing, frequently, manifest disturbances. The elongated variety,—identical in all essential respects with the great osars of Sweden,—are finely developed in eastern New England, especially in Maine, and the border of New Brunswick; while the hummocky variety, constituting the ill-defined class of kames, are abundant throughout New England, New York, northern New Jersey, Pennsylvania, Ohio, Indiana, the greater part of Michigan, northern Illinois, eastern and northern Wisconsin, northern Minnesota, north-central Iowa, eastern Dakota, and many portions of Canada. These osars and kames are among the most fascinating phenomena of the drift; but to differentiate them, and to determine to what extent they are superglacial, subglacial, and debouchure phenomena, is a triumph of discrimination not yet attained. It is of most practical importance at present to distinguish debouchure and submarginal gravel heapings, representative of the position of the glacier's edge, from the gravel veins of the glacier's body. The semi-morainic kames are the type of the one; the winding windrows of gravel, the osars, of the other. The osars frequently end in osar fans, and the kames graduate into pitted gravel plains. These pitted plains and others, not identical in type, constitute one of the singular and not least puzzling features of the assorted drift. They have a wide range; but find their most phenominal development in Wisconsin, Michigan, Ontario, and the coast of New England. The kames also graduate into true moraines; and every stage of gradation may be observed. In the progress of their accumulation, they were thrust by the adjacent ice, and heaped into ridges as genuinely morainic as though made of unwashed material. They have an especial development along the interlobate tracts.

Of valley drift formed by streams heading on the glaciers, the intermediate phases were passed with simple reference, and attention directed to two extreme phases: 1°, the moraine-headed valley trains; and 2°, the loess tracts. The former are deposits of glacial floods, when the slope gave impetus to the drainage; the latter were construed as the products of slack drainage. The former are found to show progressively coarser material toward their origin, and to merge into elevated expanded heads blending with the moraines from which they took their origin. Associated with these are glacial aprons of overwash drift, that fringe the outer sides of moraines in favorable situations. These phenomena point unequivocally to a glacial origin, and to vigorous drainage conditions. Contrasted with them are the broad tracts of fine silt, designated 'loess,' that occupy the Mississippi up to east-central Minnesota, the Missouri up to southern Dakota, the Illinois and Wabash as far up as their great bends, and the Ohio up to south-eastern Indiana. They are so correlated with the border of the ice, in the later stages of the earlier epoch, that they seem clearly to be products of glacial drainage of a fluvio-lacustrine character, indicating low gradients and slack drainage. This stands in marked contrast to the

conditions necessarily indicated by the moraine-heading coarse gravel streams; and herein lies an important discrimination of the drainage and orographic attitudes of the two glacial epochs.

In addition to the till-like phases previously noted, two assorted deposits were considered. They range in altitude from below the sea-level to three thousand feet and beyond, and vary greatly in individual extent. The great examples are the immense sheets of assorted drift overspreading the great basins of the St. Lawrence, and the Winnipeg basin. These often present, among their surest credentials, overflow channels to the southward, crossing divides often hundreds of feet above existing outlets, and varying in altitude among themselves at least two thousand feet. Some of the more important were enumerated. Reference was also made to the iceward termination of these lacustrine deposits, a phenomenon yet but partially studied. The surfaces of these ancient lakes not only stood at altitudes greatly different from the present, but were tilted, if not distorted, as compared with existing water levels, rising as a general rule, toward the north. Data are being rapidly gathered, in the effort to determine how much of this was due to ice attraction, to ice weighting, to thermal changes, to intercurrent crustal changes independent of glacial presence, and to other and undiscovered causes. Reference was made to the scorings which the glacial floor presents, and some of the more remarkable features alluded to. The number of recorded observations of striae reaches nearly three thousand.

Turning to the more purely intellectual products springing from the glacial phenomena, it was noted that our former ample assortment of theories of the origin of the drift has become practically reduced to one,—the glacial. With few exceptions, the investigators of glacial phenomena in the United States accept as demonstrated the glacial origin of the greater mass of the drift. This is less true of Canadian investigators. Subordinate to this dominant hypothesis, there are various degrees of belief respecting the extent of auxiliary glacio-natant agencies.

Our wealth of working hypotheses has increased as our theory of genesis has become fixed upon the fruitful doctrine of the glacier origin of the drift. The recent introduction of strictly glacial methods has been prolific in stimulus and in interpretation. The working hpotheses necessary for the tracing out of moraines, the discrimination of the tills, the differentiation of the kames, osars, and similar products, and for the analysis of the drainage phenomena, have become rich beyond the limits of convenient statement, and suggestive to a degree unimagined a decade since. Under these, the advance of a year is becoming as the advance of a decade.

If we turn to the broader speculations respecting the origin of the glacial epoch, we find our wealth little increased. We have on hand practically the same old stock of hypotheses, all badly damaged by the deluge of recent facts. The earlier theory of northern elevation has been rendered practically valueless; and the various astronomical hypotheses seem to be the worse for the increased knowledge of the distribution of the ancient ice sheet. Even the ingenious theory of Croll becomes increasingly unsatisfactory as the phenomena are developed into fuller appreciation. The more we consider the asymmetry of the ice distribution in latitude and longitude, and its disparity in elevation, the more difficult it becomes to explain the phenomena upon any astronomical basis. If we were at liberty to disregard the considerations forced upon us by physicists and astronomers, and permit ourselves simply to follow freely the apparent leadings of the phenomena, it appears at this hour as though we should be led upon an old and forbidden trail,—the hypothesis of a wandering pole. It is admitted that there is a *vera causa* in elevations and depressions of the earth's crust, but it is held inadequate. It is admitted that the apparent changes of latitude shown by the determinations of European and American observatories are remarkable, but their trustworthiness is challenged. Were there no barriers against free hypotheses in this direction, glacial phenomena could apparently find adequate explanation; but debarred—as we doubtless should consider ourselves to be at present—from this resource, our hypotheses remain inharmonious with the facts, and the riddle remains unsolved.

THE ECONOMICAL ASPECT OF AGRICULTURAL CHEMISTRY.

PROFESSOR WILEY opened his address with statistics showing the value of the agricultural products of the United States. He then gave figures showing the chemical constitution of the different products, and laid stress upon the necessity of supplying the growing crops with sufficient potassium, phosphorus, and nitrogen. The value of the potash, phosphoric acid, and albuminoids or nitrogen entering into a single harvest he estimated as follows, valuing potash at five cents per pound, phosphoric acid at six cents, and nitrogen at eighteen cents. The total value of each of these ingredients is, then, potash, $598,067,446;

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